

Applicants have cancelled Claims 13-16 and 27-40 as relating to non-elected subject matter. Applicants also have cancelled Claims 1-12 and 17-26, and have added new Claims 41-63. The cancellation of Claims 1-12 and 17-26 and the addition of new Claims 41-63 were made in order to provide proper antecedent basis for all claims and to facilitate the review of the pending claims by the Patent Office. Therefore, Applicants do not waive their rights to interpretative equivalents of the new claims, and particularly where elements in the new claims are identical to or are no more narrow than in the original claims. No new matter is contained in the amendments or new claims. Claims 41-63 remain pending for examination. Pursuant to 37 C.F.R. § 1.121, a marked up version of the claims is attached hereto.

I. Election/Restriction Requirement

The Office Action rejected the Applicants' traversal of the restriction requirement and made the restriction requirement final. Accordingly, Applicants have cancelled Claims 13-16 and 27-40 as being directed to nonelected inventions.

II. Claim Objections

The Office Action objected to Claims 4, 5, 6, 18, 19, 24, 25, and 26 as referring to sequence listing numbers of nonelected inventions. Applicants have cancelled all original claims, and the new claims do not refer to the sequence listing numbers of the nonelected inventions.

The Office Action also objected to Claim 12 as being a multiple dependent claim in improper form. Applicants have cancelled Claim 12 and note that the new claims refer to the other claims in the alternative only. Therefore, Applicants respectfully request that these objections to the claims be withdrawn.

III. Rejections under 35 U.S.C. § 112, first paragraph

The Office Action rejected Claims 1-3, 7-12, 17, and 21-23 under 35 U.S.C. § 112, first paragraph, as containing subject matter that is not described in such a manner that would reasonably convey to one skilled in the art that the inventors had possession of the

invention at the time the application was filed. More specifically, the Office Action stated that the specification only describes five isolated DNA molecules that encode proteins homologous to known phosphatases and that improve both drought and freeze stress tolerance when expressed. The Office Action stated that this disclosure does not constitute a substantial portion of the genera that comprise PHSRP coding nucleic acids, Protein Phosphatase 2C-1 coding nucleic acids, and orthologs thereof that increase a transgenic plant's tolerance to an environmental stress. The Office Action concluded that the disclosure does not provide an adequate description of the claimed genus such that one skilled in the art would recognize from the disclosure that the Applicants were in possession of the claimed genus.

Applicants respectfully submit that these rejections are mooted by the Applicants' cancellation of Claims 1-3, 7-12, 17, and 21-23. Therefore, Applicants respectfully request that the rejections with respect to the written description requirement be withdrawn.

The Office Action also rejected Claims 1-12 and 17-26 under 35 U.S.C. § 112, first paragraph, as not enabling one skilled in the art to make or use the invention commensurate in scope with the claims. The Office Action noted that the specification discloses that the elected PP2C-1 coding nucleic acid when expressed in transgenic *Arabidopsis* plants increases the plant's tolerance to drought and freeze stresses; however, the Office Action concluded that this disclosure is not enabling for transgenic plants comprising other PHSRP nucleic acids with tolerance to any environmental stress and for expressing PHSRP nucleic acids in a host cell type other than a plant cell.

Applicants have cancelled Claims 1-12 and 17-26. Applicants respectfully submit that new Claim 57 (corresponding to original Claim 20) contains the phrase "plant cell" rather than the phrase "host cell." Applicants respectfully submit that based on the Applicants' present disclosure of the expression of five PHSRP coding nucleic acids in a plant sufficiently describes an appropriate level at which to express other PHSRP coding nucleic acids in a plant such that the expression results in the plant's increased tolerance to an environmental stress such as drought stress or freeze stress. Everything necessary to practice the invention need not be disclosed; what is well known in the art may be omitted. *See In re Buchner*, 929 F.2d 660, 661, 18 U.S.P.Q.2d (BNA) 1331, 1332 (Fed. Cir. 1991). Applicants respectfully submit that based on

the present disclosure, one skilled in the relevant art would be capable of adjusting the level of expression of the PHSRP nucleic acid to achieve greater or lesser stress tolerance as desired. Therefore, because the specification would enable one skilled in the art to make or use the invention commensurate in scope with the claims, Applicants respectfully request that the rejections under 35 U.S.C. § 112, first paragraph be withdrawn.

IV. Rejections under 35 U.S.C. § 112, second paragraph

The Office Action rejected Claims 1-6, 17-19, and 21-26 under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter of the Applicants' invention. In particular, the Office Action stated that certain phrases in these claims render the claims indefinite.

The Office Action rejected Claims 1-6, 17-19, and 21-26 as being indefinite in the recitation of "Stress-Related Protein" or "PHSRP." Applicants note that in drafting a patent application, the applicant is permitted to be his or her own lexicographer and to use his or her own terminology, provided that it may be understood by one of skill in the art and that the meaning assigned to the term is not repugnant to the term's well known usage. *See In re Hill*, 161 F.2d 367, 73 U.S.P.Q. (BNA) 482 (CCPA 1947); MPEP §§ 608.01(g), 2111.01. Accordingly, Applicants respectfully submit that they are acting as lexicographer in using the terms "Stress-Related Protein" and "PHSRP" in order to simplify the specification. Applicants note that these terms are defined in the specification, for example, in paragraph 10 on page 3. The phosphatase stress-related protein (PHSRP) coding nucleic acids are defined as those nucleic acids that encode phosphatases and whose expression in a plant cell results in the plant cell's increased tolerance to an environmental stress as compared to a wild type variety of the cell. "Stress-Related Protein" is intended to refer to the fact that the protein is related to an increase in the plant's tolerance to an environmental stress.

The Office Action rejected Claims 1 and 21 as being indefinite in the recitation of "environmental stress." Applicants respectfully submit that the new claims recite that the environmental stress is selected from one or more of the group consisting of drought and low temperature.

The Office Action rejected Claims 6 and 26 as being indefinite in the recitation of “hybridizes under stringent conditions.” Applicants respectfully submit that the new claims recite specific stringent hybridization conditions.

The Office Action rejected Claim 10 as being indefinite in the recitation of “forage crops.” Applicants note that “forage crop” appears in new Claim 49. Applicants respectfully submit that what is encompassed by the term “forage crop” would be well known by one of skill in the art. Forage crops include, but are not limited to, Canarygrass, Bromegrass, Wildrye Grass, Bluegrass, Orchardgrass, Alfalfa, Birdsfoot Trefoil, Alsike Clover, Red Clover, and Sweet Clover. *See, e.g.*, National Grassland Research Institute’s Illustrated Encyclopedia of Forage Crop Diseases at <http://ss.ngri.affrc.go.jp/disease/detitle.htm>. A hard copy of information from this site is enclosed herewith.

The Office Action rejected Claim 12 as being indefinite in the recitation of “true breeding.” Applicants respectfully submit that new Claim 51 (corresponding to original Claim 12) specifies that the seed comprises the PHSRP nucleic acid that was introduced into the parent plant. Applicants also respectfully submit that “true breeding” is defined in the specification in paragraph 33 on page 7 as referring to when a plant is genetically homozygous for a trait to the extent that when the variety is self-pollinated, a significant amount of independent segregation of the trait among the progeny is not observed. A plant “variety” is defined as being a group of plants within a species that share a constant character that separates the variety from the typical form of the species and from other varieties within that species. In this case, the trait that the claimed variety has in common is the transgenic expression of the PHSRP coding nucleic acid.

Applicants believe that the cancellation of the original claims and the addition of the new claims have overcome the rejections under 35 U.S.C. § 112, second paragraph, and therefore, Applicants respectfully request that the rejections under 35 U.S.C. § 112, second paragraph be withdrawn.

V. Rejections under 35 U.S.C. § 101

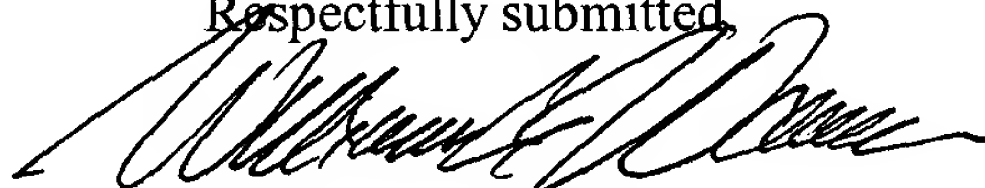
The Office Action rejected Claim 12 under 35 U.S.C. § 101, as being directed to non-statutory subject matter. The Office Action stated that the claim is not limited to a seed that

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comprises the PHSRP nucleic acid introduced into the parent plant. Applicants respectfully submit that the new Claim 51 (corresponding to original Claim 12) recites that the seed comprises the PHSRP nucleic acid introduced into the parent plant. Accordingly, Applicants respectfully request that the objection under 35 U.S.C. § 101 be withdrawn.

Applicants believe that the present application, as amended, is now in condition for allowance. Favorable reconsideration of the application as amended is respectfully requested. The foregoing is submitted as a full and complete response to the Office Action mailed August 27, 2002. No additional fees are believed to be due, however, the Commissioner is hereby authorized to charge any additional fees due or credit any overpayment to Deposit Account No. 19-5029. If there are any issues that can be resolved by a telephone conference or an Examiner's amendment, the Examiner is invited to call the undersigned attorney at (404) 853-8081.

Respectfully submitted,



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Marked Up Version of the Claims

1. (Cancelled) A transgenic plant cell transformed by a Phosphatase Stress-Related Protein (PHSRP) coding nucleic acid, wherein expression of the nucleic acid in the plant cell results in increased tolerance to an environmental stress as compared to a wild type variety of the plant cell.
2. (Cancelled) The transgenic plant cell of Claim 1, wherein the PHSRP is selected from the group consisting of Protein Phosphatase 2A (PP2A), and Protein Phosphatase 2C (PP2C); and orthologs thereof.
3. (Cancelled) The transgenic plant cell of Claim 1, wherein the PHSRP is selected from the group consisting of Protein Phosphatase 2A-2 (PP2A-2), Protein Phosphatase 2A-3 (PP2A-3), Protein Phosphatase 2A-4 (PP2A-4); Protein Phosphatase 2C-1 (PP2C-1) and Protein Phosphatase 2C-2 (PP2C-2); and orthologs thereof.
4. (Cancelled) The transgenic plant cell of Claim 3, wherein the PHSRP is selected from the group consisting of PP2A-2 as defined in SEQ ID NO:11; PP2A-3 as defined in SEQ ID NO:12; PP2A-4 as defined in SEQ ID NO:13; PP2C-1 as defined in SEQ ID NO:14; and PP2C-2 as defined in SEQ ID NO:15.
5. (Cancelled) The transgenic plant cell of Claim 3, wherein the PHSRP coding nucleic acid is selected from the group consisting of PP2A-2 as defined in SEQ ID NO:6; PP2A-3 as defined in SEQ ID NO:7; PP2A-4 as defined in SEQ ID NO:8; PP2C-1 as defined in SEQ ID NO:9; and PP2C-2 as defined in SEQ ID NO:10.
6. (Cancelled) The transgenic plant cell of Claim 1, wherein the PHSRP coding nucleic acid hybridizes under stringent conditions to a sequence of SEQ ID NO:6, SEQ ID NO:7, SEQ ID NO:8, SEQ ID NO:9, or SEQ ID NO:10.
7. (Cancelled) The transgenic plant cell of Claim 1, wherein the environmental stress is selected from the group consisting of salinity, drought and temperature.

8. (Cancelled) The transgenic plant cell of Claim 1, wherein the plant is a monocot.
9. (Cancelled) The transgenic plant cell of Claim 1, wherein the plant is a dicot.
10. (Cancelled) The transgenic plant cell of Claim 1, wherein the plant is selected from the group consisting of maize, wheat, rye, oat, triticale, rice, barley, soybean, peanut, cotton, rapeseed, canola, manihot, pepper, sunflower, tagetes, solanaceous plants, potato, tobacco, eggplant, tomato, Vicia species, pea, alfalfa, coffee, cacao, tea, Salix species, oil palm, coconut, perennial grass and forage crops.
11. (Cancelled) A transgenic plant comprising a plant cell according to any of Claims 1-8.
12. (Cancelled) A seed produced by a transgenic plant comprising a plant cell according to any of Claims 1-10, wherein the seed is true breeding for an increased tolerance to environmental stress as compared to a wild type variety of the plant cell.
13. (Cancelled) An agricultural product produced by the plant or seed of Claims 11 or 12.
14. (Cancelled) An isolated Phosphatase Stress-Related Protein (PHSRP) Phosphatase Stress-Related Protein (PHSRP), wherein the PHSRP is selected from the group consisting of Protein Phosphatase 2A (PP2A), and Protein Phosphatase 2C (PP2C); and orthologs thereof.
15. (Cancelled) The PHSRP of Claim 14, wherein the PHSRP is selected from the group consisting of Protein Phosphatase 2A-2 (PP2A-2), Protein Phosphatase 2A-3 (PP2A-3), Protein Phosphatase 2A-4 (PP2A-4); Protein Phosphatase 2C-1 (PP2C-1) and Protein Phosphatase 2C-2 (PP2C-2); and orthologs thereof.
16. (Cancelled) The PHSRP of Claim 15, wherein the PHSRP is selected from the group consisting of PP2A-2 as defined in SEQ ID NO:11; PP2A-3 as defined in SEQ ID NO:12; PP2A-4 as defined in SEQ ID NO:13; PP2C-1 as defined in SEQ ID NO:14; and PP2C-2 as defined in SEQ ID NO:15.

17. (Cancelled) An isolated Phosphatase Stress-Related Protein (PHSRP) coding nucleic acid, wherein the PHSRP coding nucleic acid codes for a PHSRP selected from the group consisting of Protein Phosphatase 2A (PP2A), and Protein Phosphatase 2C (PP2C); and orthologs thereof.

18. (Cancelled) The PHSRP coding nucleic acid of Claim 17, wherein the PHSRP coding nucleic acid is selected from the group consisting of PP2A-2 as defined in SEQ ID NO:6; PP2A-3 as defined in SEQ ID NO:7; PP2A-4 as defined in SEQ ID NO:8; PP2C-1 as defined in SEQ ID NO:9; and PP2C-2 as defined in SEQ ID NO:10.

19. (Cancelled) The PHSRP coding nucleic acid of Claim 17, wherein the PHSRP coding nucleic acid hybridizes under stringent conditions to a sequence of SEQ ID NO:6, SEQ ID NO:7, SEQ ID NO:8, SEQ ID NO:9, SEQ ID NO:10.

20. (Cancelled) An isolated recombinant expression vector comprising a nucleic acid of Claims 18 or 19, wherein expression of the vector in a host cell results in increased tolerance to environmental stress as compared to a wild type variety of the host cell.

21. (Cancelled) A method of producing a transgenic plant containing a Phosphatase Stress-Related Protein (PHSRP) coding nucleic acid, wherein expression of the nucleic acid in the plant results in increased tolerance to environmental stress as compared to a wild type variety of the plant, comprising, transforming a plant cell with an expression vector comprising the nucleic acid, generating from the plant cell a transgenic plant with an increased tolerance to environmental stress as compared to a wild type variety of the plant.

22. (Cancelled) The method of Claim 21, wherein the PHSRP is selected from the group consisting of Protein Phosphatase 2A (PP2A), and Protein Phosphatase 2C (PP2C); and orthologs thereof.

23. (Cancelled) The method of Claim 21, wherein the PHSRP is selected from the group consisting of Protein Phosphatase 2A-2 (PP2A-2), Protein Phosphatase 2A-3 (PP2A-3), Protein

Phosphatase 2A-4 (PP2A-4); Protein Phosphatase 2C-1 (PP2C-1) and Protein Phosphatase 2C-2 (PP2C-2); and orthologs thereof.

24. (Cancelled) The method of Claim 23, wherein the PHSRP is selected from the group consisting of PP2A-2 as defined in SEQ ID NO:11; PP2A-3 as defined in SEQ ID NO:12; PP2A-4 as defined in SEQ ID NO:13; PP2C-1 as defined in SEQ ID NO:14; and PP2C-2 as defined in SEQ ID NO:15.

25. (Cancelled) The method of Claim 21, wherein the PHSRP coding nucleic acid is selected from the group consisting of PP2A-2 as defined in SEQ ID NO:6; PP2A-3 as defined in SEQ ID NO:7; PP2A-4 as defined in SEQ ID NO:8; PP2C-1 as defined in SEQ ID NO:9; and PP2C-2 as defined in SEQ ID NO:10.

26. (Cancelled) The method of Claim 21, wherein the PHSRP coding nucleic acid hybridizes under stringent conditions to a sequence of SEQ ID NO:6, SEQ ID NO:7, SEQ ID NO:8, SEQ ID NO:9, SEQ ID NO:10.

27. (Cancelled) A method of modifying stress tolerance of a plant comprising, modifying the expression of a Phosphatase Stress-Related Protein (PHSRP) in the plant.

28. (Cancelled) The method of Claim 27, wherein the PHSRP is selected from the group consisting of Protein Phosphatase 2A (PP2A), and Protein Phosphatase 2C (PP2C); and orthologs thereof.

29. (Cancelled) The method of Claim 27, wherein the PHSRP is selected from the group consisting of Protein Phosphatase 2A-2 (PP2A-2), Protein Phosphatase 2A-3 (PP2A-3), Protein Phosphatase 2A-4 (PP2A-4); Protein Phosphatase 2C-1 (PP2C-1) and Protein Phosphatase 2C-2 (PP2C-2); and orthologs thereof.

30. (Cancelled) The method of Claim 29, wherein the PHSRP is selected from the group consisting of PP2A-2 as defined in SEQ ID NO:11; PP2A-3 as defined in SEQ ID NO:12; PP2A-

4 as defined in SEQ ID NO:13; PP2C-1 as defined in SEQ ID NO:14; and PP2C-2 as defined in SEQ ID NO:15.

31. (Cancelled) The method of Claim 27, wherein the PHSRP coding nucleic acid is selected from the group consisting of PP2A-2 as defined in SEQ ID NO:6; PP2A-3 as defined in SEQ ID NO:7; PP2A-4 as defined in SEQ ID NO:8; PP2C-1 as defined in SEQ ID NO:9; and PP2C-2 as defined in SEQ ID NO:10.

32. (Cancelled) The method of Claim 27, wherein the PHSRP coding nucleic acid hybridizes under stringent conditions to a sequence of SEQ ID NO:6, SEQ ID NO:7, SEQ ID NO:8, SEQ ID NO:9, SEQ ID NO:10.

33. (Cancelled) The method of Claim 27, wherein the stress tolerance is increased.

34. (Cancelled) The method of Claim 27, wherein the stress tolerance is decreased.

35. (Cancelled) The method of Claim 27, wherein the plant is not transgenic.

36. (Cancelled) The method of Claim 27, wherein the plant is transgenic.

37. (Cancelled) The method of Claim 36, wherein the plant is transformed with a promoter that directs expression of the PHSRP.

38. (Cancelled) The method of Claim 37, wherein the promoter is tissue specific.

39. (Cancelled) The method of Claim 37, wherein the promoter is developmentally regulated.

40. (Cancelled) The method of Claim 27, wherein PHSRP expression is modified by administration of an antisense molecule that inhibits expression of PHSRP.

41. (New) A transgenic plant cell transformed by a Phosphatase Stress-Related Protein (PHSRP) coding nucleic acid, wherein expression of the PHSRP in the plant cell results in the plant cell's increased tolerance to an environmental stress as compared to a wild type variety of the plant cell, wherein the environmental stress is selected from one or more of the group consisting of drought and low temperature, and wherein the PHSRP is a *Physcomitrella patens* PHSRP.

42. (New) The transgenic plant cell of Claim 41, wherein the PHSRP is a PP2C-1 protein as defined in SEQ ID NO:12.

43. (New) The transgenic plant cell of Claim 41, wherein the PHSRP coding nucleic acid comprises a polynucleotide as defined in SEQ ID NO:9.

44. (New) A transgenic plant cell transformed by a Phosphatase Stress-Related Protein (PHSRP) coding nucleic acid, wherein the PHSRP coding nucleic acid hybridizes under stringent conditions to at least one sequence selected from the group consisting of the sequence of SEQ ID NO:9 and the full-length complement of the sequence of SEQ ID NO:9, and wherein the stringent conditions comprise at least one wash in a 0.2X sodium chloride/sodium citrate (SSC), 0.1% SDS solution at 50°C.

45. (New) The transgenic plant cell of Claim 44, wherein the stringent conditions comprise an initial hybridization in a 6X SSC solution at 45°C followed by at least one wash in a 0.2X SSC, 0.1% SDS solution at 50°C.

46. (New) A transgenic plant cell transformed by a PHSRP coding nucleic acid, wherein the PHSRP coding nucleic acid comprises a polynucleotide encoding a polypeptide having at least 80% sequence identity with a polypeptide as defined in SEQ ID NO:14.

47. (New) The transgenic plant cell of any of Claims 41, 42, 43, 44, or 46, wherein the plant is a monocot.

48. (New) The transgenic plant cell of any of Claims 41, 42, 43, 44, or 46, wherein the plant is a dicot.

49. (New) The transgenic plant cell of any of Claims 41, 42, 43, 44, or 46, wherein the plant is selected from the group consisting of maize, wheat, rye, oat, triticale, rice, barley, soybean, peanut, cotton, rapeseed, canola, manihot, pepper, sunflower, tagetes, solanaceous plants, potato, tobacco, eggplant, tomato, Vicia species, pea, alfalfa, coffee, cacao, tea, Salix species, oil palm, coconut, perennial grass, and a forage crop.

50. (New) A transgenic plant comprising a plant cell according to any of Claims 41, 42, 43, 44, or 46.

51. (New) A seed produced by a transgenic plant comprising a plant cell according to any of Claims 41, 42, 43, 44, or 46, wherein the seed comprises the PHSRP nucleic acid, wherein the seed is true breeding for an increased tolerance to an environmental stress as compared to a wild type variety of the plant cell, and wherein the environmental stress is selected from one or more of the group consisting of drought and low temperature.

52. (New) An isolated Phosphatase Stress-Related Protein (PHSRP) coding nucleic acid, wherein the PHSRP coding nucleic acid comprises a polynucleotide that encodes a polypeptide as defined in SEQ ID NO:14.

53. (New) The isolated PHSRP coding nucleic acid of Claim 52, wherein the PHSRP coding nucleic acid comprises a polynucleotide as defined in SEQ ID NO:9.

54. (New) An isolated PHSRP coding nucleic acid, wherein the PHSRP coding nucleic acid hybridizes under stringent conditions to at least one sequence selected from the group consisting of the sequence of SEQ ID NO:9 and the full-length complement of the sequence of SEQ ID NO:9, and wherein the stringent conditions comprise at least one wash in a 0.2X sodium chloride/sodium citrate (SSC), 0.1% SDS solution at 50°C.

55. (New) The PHSRP coding nucleic acid of Claim 54, wherein the stringent conditions comprise an initial hybridization in a 6X SSC solution at 45°C followed by at least one wash in a 0.2X SSC, 0.1% SDS solution at 50°C.

56. (New) An isolated PHSRP coding nucleic acid, wherein the PHSRP coding nucleic acid comprises a polynucleotide encoding a polypeptide having at least 80% sequence identity with a polypeptide as defined in SEQ ID NO:14.

57. (New) An isolated recombinant expression vector comprising an PHSRP coding nucleic acid of Claims 52, 53, 54, or 56, wherein expression of the PHSRP in a plant cell results in the plant cell's increased tolerance to an environmental stress as compared to a wild type variety of the plant cell, and wherein the environmental stress is selected from one or more of the group consisting of drought and low temperature.

58. (New) A method of producing a transgenic plant containing a Phosphatase Stress-Related Protein (PHSRP) coding nucleic acid, wherein expression of the PHSRP in the plant results in the plant's increased tolerance to an environmental stress as compared to a wild type variety of the plant, comprising,

- a. transforming a plant cell with an expression vector comprising the nucleic acid; and
- b. generating from the plant cell a transgenic plant with an increased tolerance to an environmental stress as compared to a wild type variety of the plant,

wherein the PHSRP is a *Physcomitrella patens* PHSRP, and wherein the environmental stress is selected from one or more of the group consisting of drought and low temperature.

59. (New) The method of Claim 58, wherein the PHSRP is a PP2C-1 polypeptide as defined in SEQ ID NO:14.

60. (New) The method of Claim 58, wherein the PHSRP coding nucleic acid comprises a polynucleotide as defined in SEQ ID NO:9.

61. (New) A method of producing a transgenic plant containing a Phosphatase Stress-Related Protein (PHSRP) coding nucleic acid, wherein expression of the PHSRP in the plant

results in the plant's increased tolerance to an environmental stress as compared to a wild type variety of the plant, comprising,

- a. transforming a plant cell with an expression vector comprising the nucleic acid; and
- b. generating from the plant cell a transgenic plant with an increased tolerance to an environmental stress as compared to a wild type variety of the plant,

wherein the PHSRP coding nucleic acid hybridizes under stringent conditions to at least one sequence selected from the group consisting of the sequence of SEQ ID NO:9 and the full-length complement of the sequence of SEQ ID NO:9, wherein the stringent conditions comprise at least one wash in a 0.2X sodium chloride/sodium citrate (SSC), 0.1% SDS solution at 50°C, and wherein the environmental stress is selected from one or more of the group consisting of drought and low temperature.

62. (New) The method of Claim 61, wherein the stringent conditions comprise an initial hybridization in a 6X SSC solution at 45°C followed by at least one wash in a 0.2X SSC, 0.1% SDS solution at 50°C.

63. (New) A method of producing a transgenic plant containing a Phosphatase Stress-Related Protein (PHSRP) coding nucleic acid, wherein expression of the PHSRP in the plant results in the plant's increased tolerance to an environmental stress as compared to a wild type variety of the plant, comprising,

- a. transforming a plant cell with an expression vector comprising the nucleic acid; and
- b. generating from the plant cell a transgenic plant with an increased tolerance to an environmental stress as compared to a wild type variety of the plant,

wherein the PHSRP coding nucleic acid comprises a polynucleotide encoding a polypeptide having at least 80% sequence identity with a polypeptide as defined in SEQ ID NO:14, and wherein the environmental stress is selected from one or more of the group consisting of drought and low temperature.

Illustrated Encyclopedia of Forage Crop Diseases

Japanese version

Most forage crops are grasses and legumes. As there are many species of these crop plants, it is characteristic that many kinds of diseases occur on them. We have researched the diseases of forage crops for many years in the plant disease laboratory of NGRI. Now, informations and photographs of the symptoms and causal agents of forage crop diseases are available on the the internet.

When you retrieve from the list of plant names or pathogen names, you will find photographs and explanations of each disease. This time, we add the other items of forage crop diseases and encyclopaedia of fungi. (1998.3.30)

- Retrieval by disease names
- Retrieval by pathogen names

Encyclopaedia of fungi

- LINK
-

Please excuse any imperfections in the English explanations as the translation is made by a machine.

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Tadayuki Shimanuki



Please click on the plant name.



Forage crops

- Corn(*Zea mays* L.)
- Sorghum(*Sorghum bicolor* Moench)
- Pearl millet(*Pennisetum americanum* (L.) Leeke)
- Teosint (*Euchlaena mexicana* Schrad.)
- Oat(*Avena sativa* L.)
- Rye(*Secale cereale* L.)

Grasses

- Orchardgrass(*Dactylis glomerata* L.)
- Ryegrass(*Lolium* spp.)
- Fescue(*Festuca* spp.)
- Timothy(*Phleum pratense* L.)
- Redtop(*Agrostis gigantea* Roth)
- Reed canarygrass(*Phalaris arundinacea* L.)
- Sweet vernalgrass(*Anthoxanthum odoratum* L.)
- Bromegrass(*Bromus* sp.)
- Lovegrass(*Eragrostis* sp.)
- Velvetgrass(*Holcus lanatus* L.)
- Bluestem(*Bothriochloa* sp.)
- Rhodesgrass(*Chloris gayana* Kunth)
- Kikuyugrass(*Pennisetum clandestinum* Hochst. ex Chiov.)
- Fall panicum(*Panicum dichotomiflorum* Michx.)
- Bluepanic(*Panicum antidotale* Retz.)
- Greenpanic(*Panicum maximum* Jacq. var. *trichoglume* Erbas)
- Switchgrass(*Panicum virgatum* L.)
- Paspalum(*Paspalum* spp.)
- African millet(*Eleusine coracana* Gaertn.)
- St. Augustine grass(*Stenotaphrum secundatum* (Walt.) O.Kunze)
- Carpetgrass(*Axonopus affinis* Chase.)
- Giant-star-grass(*Cynodon dactylon* L.)
- Paragrass(*Brachiaria mutica* (Forsk.) Stapf)
- Pangolagrass(*Digitaria decumbens* Stent)
- Centipedegrass(*Eremochloa ophiuroides* (Munro) Hack.)

Turf grass

- Bluegrass(*Poa* spp.)
- Bentgrass(*Agrostis* spp.)
- Zoysia grass(*Zoysia japonica* Steud.)
- Bermudagrass(*Cynodon dactylon* (L.) Pers.)

Legumes

- Alfalfa(*Medicago sativa* L.)
- Red clover(*Trifolium pratense* L.)
- White clover(*Trifolium repens* L.)
- Crimson clover(*Trifolium incarnatum* L.)
- Alsike clover(*Trifolium hybridum* L.)
- Subterranean clover(*Trifolium subterraneum* L.)
- Strawberry clover(*Trifolium fragiferum* L.)
- Sweet clover(*Melilotus* sp.)
- Common vetch(*Vicia sativa* L.)
- Hairy vetch(*Vicia villosa* Roth)
- Trefoil(*Lotus* spp.)
- Chinese milk vetch(*Astragalus sinicus* L.)

Cereals

- Foxtail millet(*Setaria italica* Beauv.)
- Barnyard millet(*Echinochloa crus-galli* P.Beauv. var. *frumentacea* Wight)
- Millet(*Panicum miliaceum* L.)
- Job's tear(*Coix lachryma-jobi* L. var. *ma-yuen* (Roman.) Stapf)
- Adley(*Coix lachryma-jobi* L.)

Gramineous weeds

Oryzeae

- Ashi-kaki(*Leersia japonica* Makino)
- Vegetable wild rice(*Zizania latifolia* (Griseb.) Turcz. ex Stapf)

Poideae

- Big quaking-grass(*Briza maxima* L.)

Aveneae

- Orange fox-tail(*Alopecurus aequalis* Sobol. var. *amurensis* (Komar.) Ohwi)
- American sloughgrass(*Beckmannia syzigachne* (Steud.) Fern.)

Arundineae

- Common reed(*Phragmites communis* Trinius)

Eragrostideae

- Ito-azegaya(*Leptochloa panicea* (Retz.) Ohwi)
- Kaze-kusa(*Eragrostis ferruginea* (Thunb.) Beauv.)
- Goosegrass(*Eleusine indica* (L.) Gaeren.)
- Smutgrass(*Sporobolus fereilis* (Steud.) W.Clayton)

Cynodonteae

- Shima-hige-shiba(*Chloris barbata* Swartz)

Paniceae

- Chijimi-zasa(*Oplismenus undulatifolius* (Ard.) Roem. et Schult.)
- Barnyard grass(*Echinochloa crus-galli* (L.) Beauv.)
- Green bristlegrass(*Setaria viridis* (L.) Beauv.)
- Southern crab-grass(*Digitaria ciliaris* (Retz.) Koel.)
- Violet crab-grass(*Digitaria violascens* Link.)
- Chikara-shiba(*Pennisetum alopecuroides* (L.) Speng.)

Andropogoneae

- Euly(*Miscanthus sinensis* Andress.)
- Cogon grass(*Imperata cylindrica* L. var. *koenigii* (Retz.) Pilger in Perk.)
- Ashi-boso(*Microstegium vimineum* (Trin.) A.Camus)
- Okinawa-michishiba(*Chrysopogon aciculatus* Trin.)
- Greek grass(*Arthraxon hispidus* (Thunb.) Makino)

Other weeds

- Knotweed(*Polygonum thunbergii* Sieb. et Zunc.)
- Buttercup(*Ranunculus acris* L. var. *japonicus* Maxim.)
- Bushclover(*Lespedeza bicolor* Turcz. var. *japonica* Nakai)
- Plantain(*Plantago asitica* L.)
- Golden rod(*Solidago altissima* L.)
- Mugwort(*Artemisia vulgaris* L. var. *indica* Maxim.)
- Asiatic dayflower(*Commelina communis* L.)

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